DOCUMENT REVIEW COMMENT RECORD OF EPA AND CDH COMMENTS

FINAL PHASE II RFI/RI WORK PLAN (Bedrock)

ROCKY FLATS PLANT
GOLDEN, COLORADO

903 PAD, MOUND AND EAST TRENCHES AREAS
(Operable Unit No 2)

U S DEPARTMENT OF ENERGY
Rocky Flats Plant
Golden, Colorado

EG&G ROCKY FLATS

ENVIRONMENTAL RESTORATION PROGRAM

REVIEWED FOR CLASSIFICATION/UCNI
By F J Curran
Date 1-4-94

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ADMIN RECORD

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PHASE II RFI/RI WORK PLAN (BEDROCK)

This document presents the disposition of review comments on the Phase II RFI/RI Work Plan (Bedrock) made by the U S Environmental Protection Agency (EPA) and the Colorado Department of Health (CDH) It accompanies the final Phase II RFI/RI bedrock work plan to satisfy requirements of the Interagency Agreement (IAG) Sections 1 0 and 2 0 present EPA and CDH comments respectively and DOE responses to the comments in the Rocky Flats document and comment record format The sections are prefaced with the EPA and CDH cover letters that transmitted the comments

SECTION 1.0
EPA COMMENTS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
999 18th STREET - SUITE 500
DENVER COLORADO 80202-2405

Ref 8HWM-FF

Mr David P Simonson
Department of Energy
Rocky Flats Area Office
P O Box 928
Golden CO 80402-0928

re OU 2 Bedrock Workplan Comments

Dear Mr Simonson

This letter transmits EPA s comments on the subject document as submitted 5 February 1991 Attached please find these comments and those of our tecnnical review contractor Comments from the State of Colorado will be submitted separately

The plan submitted represents a distinct improvement over those presented previously in the overall understanding of and technical approach to the RI process However, given that this is the second (bedrock) half of what will be a single OU 2 Phase II RI it seems corpulent in some areas and skeletal in others Background information (largely taken from the alluvial plan) makes up a much larger portion of the document than the Field Sampling Plan which is really the heart of the matter It would seem that sections 1-6 could be greatly abbreviated without weakening the presentation

It also must be clearly understood that the Phase II Bedrock investigation is not merely a prelude to a full scale RI This plan should lay out the investigation necessary to characterize bedrock conditions to the extent required for risk assessment and remedial action decision making The plan can be amended if necessary based on early findings but the full anticipated RI scope must be identified in this plan

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CITATION	COMMENT	DISPOSITION
General Comments		
E-1 1	The subject plan represents a distinct improvement over those presented previously in the overall understanding of technical approach to the RI process However given that this is the second (bedrock) half of what will be a single OU2 Phase II RI it seems corpulent in some areas and skeletal in others Background information (largely taken from the alluvial plan) makes up a much larger portion of the document than the Field Sampling Plan, which is really the heart of the matter It would seem that Sections 1-6 could be greatly abbreviated without the presentation losing anything Section 5 0 for example, presents 14 pages of generic RI guidance and little if any information directly relevant to design or execution of a remedial investigation in the OU2 bedrock By contrast Section 8 0 offers only a minimal description of the logic and procedures to be applied in well drilling and completion, perhaps the key item in the investigation.	Further thought has been given to the field sampling plan Although it has been clarified, it has not been significantly enlarged. The logic and procedures to be applied in well drilling and completion are addressed in more detail in the SOPs Sections 1-6 have not been substantially abbreviated to stay consistent with the presentation the alluvial work plan
E 1 2	In several instances (Sections 3 4.5 8 1, 8.3.2, etc.) the discussion becomes very confusing due to inconsistent use of the terms initial step and first step Apparently they are sometimes intended to distinguish the program outlined from some other effort which may or may not take place later At other times, the "20 clusters are referred to interchangeably by both terms Please understand that the Phase II Bedrock investigation is not a prelude for a full scale RI This plan should lay out the investigation necessary to characterize bedrock conditions to the extent required for risk assessment and remedial action decision making. The plan can be amended if necessary based on early findings, but the full anticipated RI scope must be identified in this plan	The Phase II, RFI/RI bedrock work plan consists of one program to investigate contamination and pathways in the lower hydrostratigraphic unit (HSU) Data needs will be reviewed periodically to modify the proposed sampling activities based on interim information that is obtained. This will include additional wells and boreholes that encounter confined sandstone units, and deepening some of the boreholes that were originally proposed in the draft work plan. The plan lays out the investigation necessary to characterize bedrock conditions to the extent required for risk assessment and remedial action decision making. The full anticipated RI scope is identified in the plan. The field sampling plan has been revised and Figure 8 2 changed to clarify the approach.

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E 1 3	Fieldwork related portions of this document (FSP and SOPA) need to be carefully examined in conjunction with the final sitewide SOP s, to make certain all necessary information is provided in a clear concise format which allows field geologists (who have only these documents to go by as a guide) to make correct, consistent and timely judgements as the drilling program proceeds As we have said before these plans should be written and formatted for use in the field. Simple steps such as moving the lengthy data tables to an appendix, as in other such plans, would greatly improve readability It appears a great deal of thought went into working out problems relating to isolating and placing monitoring points in distinct formations, but this is not clearly reflected in the discussion presented, due to awkward writing and flawed organization	Revisions have been made to the field sampling plan to clarify the field program For example a figure has been added to summarize borehole sampling requirements Lengthy data tables have been moved to an appendix.
E-1 4	In presenting the conceptual model of the OU2 subsurface structure, an important step has been taken toward the understanding of contaminant transport and fate in this area, EPA applauds that effort. Yet much of the information (such as the seismic work) on which this model is based was not subject to regulatory review and is, by its nature, open to varying interpretations We maintain that it is of paramount importance that the data obtained as a result of this RI effort be capable either of supporting this model against outside scrutiny or providing a basis for another one DOE is apparently continuing research and investigations into subsurface conditions, and should propose any plan additions or changes warranted by information which comes to light during the review process.	It is agreed that the data obtained during the RFI/RI efforts should be defensible DOE is continuing research and in vestigation into subsurface conditions, and the details will be finalized as part of the RI report
E 1.5	At several points within the plan, conclusions are presented on levels of certain constituents that constitute contamination. In addition to being premature and unnecessary this poses a particular problem in the case of radionuclides, for which the data are unvalidated and/or reflect unacceptably high detection limits Neither the data nor the evaluation procedures used to calculate a "background level,	The discussion of contamination in the bedrock is based on limited data. The observations made should not be construed as firm conclusions However the use of statistical procedures to compare the concentration of analytes in the bedrock groundwater in OU2 to concentrations of the same analytes in background wells is believed to be appropriate and

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E 1.5 (Cont)	including the use of tolerance intervals appear adequate to support the conclusion made, which is basically that there is no radionuclide problem in this area. This raises a number of questions, including why interim actions are underway to address exactly such a problem These unsupported conclusions must be removed, and DOE must completely reexamine the question of background levels for radionuclides In so doing, please reference our comments on the Background Geochemical Characterization Report.	is consistent with EPA 530 SW-89-026 Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities Interim Final. Final conclusions regarding the levels of constituents that constitute contamination will be presented in the RI report. In the case of radionuclides, the work plan text has been slightly revised to clarify that the observation is that there is no firm evidence of radionuclide contamination in the bedrock, rather than the misinterpreted conclusion that there is no radionuclide problem in this area. There are not interim actions to address radionuclide contamination in the bedrock The IRA addresses radionuclides in seeps The water emerging at seeps is believed to consist of alluvial groundwater near the ground surface This will be investigated during the bedrock RFI/RI
E 1 6	Although DOE acknowledged that it is appropriate to identify location-specific ARARs early in the RI process to identify possible restrictions on ER activities in a certain area, the work plan doesn t mention how this will be done or where the findings will be reported. Chapter 5 must be amended to show that the RI report specifically addresses ARARs In fact, action specific (and to some extent location specific) ARARs may be pertinent to RI activities particularly those governing management of investigation-derived wastes, which will directly impact the conduct of the investigation These ARARs must be identified in the Work Plan	As required in the IAG Attachment 2, Statement of Work, Section IV DOE has developed SOPs for field investigation activities which include procedures for the proper management of investigation derived wastes. All waste generated by the various investigations conducted at RFP will follow the SOPs The SOPs satisfy the IAG requirement to comply with ARARs as they relate to investigation activities Rather than amending Section 5 0 subsection 3 2.3 has been revised in response to this comment.

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CITATION	COMMENT	DISPOSITION
E 2 Specific Comments		No Comment Required
E 3 Section 1.0 Page 1 1	References to the IAG must be updated to indicate it is now signed and in force	Section 1 0 has been revised to update the status of the IAG
E-4 Section 1.4.1.4, Page 1 25	Various materials were destroyed What does that mean, burned? Can you be more specific?	There is no more specific information available at this time
E 5 Section 1.2, Page 1 5	The Geologic Characterization and Seismic Reflection Profiling reports referenced here must be made available for both regulatory and public review to the extent that they impact remedial action decisions, which is apparently considerable This need not involve issue and distribution of unreasonable cumbersome items, but must include dissemination of information sufficient to allow parties outside DOE to make a critical evaluation of the decision.	During the IAG negotiations, all parties agreed that the agencies would not receive a single Plant geologic characterization report, but rather would receive the data and conclusions from the individual OU work plans Table 2 1 and Appendix A present borehole and well lithology information pertinent to OU2 and Section 2 of the work plan presents interim results of the ongoing geologic characterization.
E-6 Section 2.1.1.2, Page 2 5	The alluvial activities described in existing plans do not appear to address discrepancies between the geologic and seismic reports, which apparently didn t exist when the alluvial plan was written. Please specify how when, and under what program field efforts necessary to resolve these discrepancies will be completed.	The draft geologic characterization and draft seismic reports did not exist when alluvial work plan was written. The results of these ongoing studies have been updated a number a times. The efforts necessary to resolve discrepancies between the geologic characterization and seismic profiling study will be accomplished during the OU2 bedrock RFI/RI and the ongoing site geologic characterization study The OU2 bedrock RFI/RI includes geophysical borehole logging at the locations of the potential sandstone channels identified by the seismic work to provide velocity control and confirmation of the lithology

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E 7 Section 2.2	The hillside seeps in this area have been a major source of concern, and the subject of two interim actions They were mapped and discussed in Section 2.1 However this section makes no mention of the significance of, or even consideration given to the seep data in assessing the nature and extent of contamination. Please include such a discussion, or explain why it is not considered relevant, especially in light of statements that the seeps represent water discharging from subcropping sandstones	As discussed in Subsection 2.1.2 1 in the draft final bedrock work plan, seeps occur along the edge of the pediment at the alluvium/bedrock contact Although, it is not known whether or not seeps represent water discharging from subcropping sandstones, it is believed to be more likely that seeps represent alluvial groundwater discharging from the colluvium where it thins on the hillside slopes The potential for bedrock groundwater to discharge from subcropping sandstones will be investigated at the locations where such conditions prevail Well clusters are proposed at suspected areas of subcropping of the lower stratigraphic intervals of sandstone to evaluate groundwater chemistry and gradients at these locations Seep data are presented in more detail in the alluvial work plan.
E 8 Section 2.2.2.	This section requires revision in accordance with the general comments above and the comments on the Background Geochemical Characterization Report	(Note see comments to Citation E 1.5)
E 9 Tables 2-2A thru 2.5A.	For the amount of space they take up this series of tables seem to present very little germane information. They should either be put in an appendix or left out, unless it can be clearly described how this information impacts the design and scope of the Phase II (Bedrock) RI	These tables and the analytical chemistry data tables have been moved to Appendix B
E 10 Section 2.2.2.3, Page 2 52.	Please see general comments relative to definitions of contamination, the one provided here is not appropriate or acceptable	See response to comment E 1.5 The text has been revised to include the citation of a reference EPA 530-SW-89 206 Statistical Analysis of Groundwater Data of RCRA Facilities Interim Final

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E 11 Section 2.2.2.4 Page 2 59	An illustration, or example or some other format is required to explain the concept being discussed here it is inherently difficult to grasp based on a textual description, no matter how adroitly written	The text has been revised to include the citation of references (Gilbert and Kinneson [1981] Kenipe [1977] and NCRP Report No 58 [1978]) to help explain the analysis of radionuclides
E 12 Section 2 2.3	This section requires revision in accordance with the general comments above and the comments on the Background Geochemical Characterization Report	See response to Citations E 1.5 and E 10
E 13 Section 2.3.1, Page 2 114	If the bedrock beneath OU1 has not been characterized sufficiently to determine its possible effect on OU2, collection of this information must be incorporated in the OU1 RI plans If this has not already been done, coordination with the OU1 management and field team is required to see that the appropriate investigations are conducted during the OU1 field investigation	The efforts required to characterize the bedrock will be coordinated among the OU2, OU1, and geologic characterization programs The evaluation of site wide geologic characterization and OU2 bedrock data will be required before it is known whether or not further characterization of the bedrock beneath OU1 will be necessary
E 14 Section 2.3.2	If these wells serve no useful purpose and there is good reason to believe they represent a release mechanism they should be properly abandoned without delay	DOE concurs and a program is being developed to abandon these wells
E-15 Table 3-1	Is the standard for Carbon Disulfide an ARAR or a TBC? Subpart F standards should be classified consistently	The Subpart F standard for carbon disulfide is corrected as "TBC"

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E 16 Section 3.4.1, Page 3-13	EPA disagrees with DOE s assertion that it is inappropriate to apply such [Federal Water Quality] criteria to groundwater since they are intended for the protection of surface water CERCLA Section 121(d)(2)(B)(i) states that [i]n determining whether or not any criteria under the Clean Water Act is relevant and appropriate under the circumstances of the release or threatened release the President shall consider the designated or potential use of the surface or groundwater, the environmental media affected, the purposes for which such criteria were developed, and the latest information available [emphasis added] The criteria are intended to protect drinking water and aquatic biota. Since the bedrock aquifer is hydraulically connected to the surface waters and thereby directly affects their quality the criteria must be identified and evaluated as potential ARARs	DOE concurs with the Colorado WQCC that surface water standards should be applied to unconfined aquifers (the Rocky Flats and other Quaternary units, or the upper HSU in this work plan) This work plan addresses investigation of confined (lower HSU) groundwater in bedrock, which the Colorado WQCC classifies as Domestic Use Quality" and Agricultural Use Quality and does not include Surface Water Protection Therefore, surface water standards are not applied to confined groundwater in bedrock, unless or until the groundwater is discharged to the surface
E 17 Section 3.4.4, Page 3-14	The status of RFP groundwater as reflected here and in Table 3-1 needs to be updated in accordance with recent Colorado WQCC classification actions	Section 3 4 4 and Table 3-1 do reflect the status of the Colorado WQCC standards for groundwater As stated in Section 3 1 of this RFI/RI work plan, the NCP (40 CFR 300 400 (g)(4)) requires that the state standards are considered to be promulgated when they are 1) of general applicability and 2) are legally enforceable Currently the Colorado WQCC site-specific standards for groundwater do not have general applicability since the State has yet to enact any site-specific standards for any other site or river basin Nor has the State determined how to enforce the site specific and statewide groundwater standards.
E 18 Section 3.4.5	Please explain what Phase II is, how this abbreviated list of contaminants was selected for inclusion in it (without benefit of Phase I we presume) and when and by whom the scope of the FS was decided on.	Assuming the correct interpretation of these questions, this work plan is the "Phase II RFI/RI Work Plan Proposed ARARs/TBCs were proposed for compounds identified at or above detection limit from data generated during the Phase I RFI/RI investigation Section 3 4.5 concludes the discussion

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		of the ARARs process. The third sentence in paragraph 1 of Section 3 4.5 has been amended to clarify that this is the Phase II work plan The last sentence in paragraph 1 of Section 3 4.5 "The FS will evaluate technologies that address these constituents is based on EPA CERCLA RI/FS and RCRA RFI/CMS guidance (see Section 11 0 References)
E 19 Section 5.7	This narrative indicates that the technology screening process has been completed No information is provided on how and when this was done, or by whom Please explain how it is possible that this work is complete when the Treatability Study Plan for RFP has not yet been submitted, nor has the RI been submitted or approved In any event these (apparently independent) efforts must be coordinated	The text has been revised to indicate that technologies will be identified for further screening per CERCLA. The CERCLA screening process could eliminate some technologies and identify new ones
E 20 Figure 8-1	The proposed investigation ignores the area north of a line through borings 1 2, and 3 where there is little control, and where channels and depressions in the bedrock surface are indicated. The pattern for the #1 sand mapped here reflects mostly a speculative depositional pattern and contestable data extrapolation. The lack of any attempt to substantiate conditions in this area must be justified. The location of boring #19 does not match the description provided in Table 8-1	Figure 2 3 shows an area in the Walnut Creek drainage where alluvium and bedrock above the elevation of the bottom of the interval of the Arapahoe Sandstone #1 has been removed by erosion. The south edge of this area passes within approximately 200 to 300 feet of the line described. The alluvial RFI/RI program will involve drilling a number of wells and boreholes within this area, which will further delineate the Arapahoe sandstone #1 For lower sandstone intervals, well 2287BR and 3486 provide information north of this line Therefore it is not believed additional boreholes in this area are necessary at the present Table 8-1 has been revised to show that Cluster #19 is located just south of the west portion of east trenches area, not the east portion of the east trenches ares

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E 21 Figure 8-2.	As this figure correctly illustrates, the Field Sampling Plan should be based on characterization of pathways of concern in this OU Success in this endeavor seems unlikely unless the pathways of concern are identified prior to and considered in, design of the sampling and analysis program This has apparently not been done this analysis must be completed, and pathways explicitly identified in the revised Work Plan. Please reference the Risk Assessment Guidance for Superfund for appropriate procedures	Conceptual potential exposure pathways are identified in Subsection 2.3.3 and in Figure 2 24 The pathways referred to in Figure 8-2 were not conceptual pathways, but rather individual geologic pathways However the figure has been revised to clarify the RFI/RI process for the OU2 bedrock
E-22 Section 8.2.1 Page 8-5	This paragraph indicates a high degree of coordination with the alluvial RI will be required in placing borings, but it is not at all clear that the locations selected reflect this Please explain if this is to be done later and if so how the schedules of the two efforts fit together to allow for this the information we have indicates problems here	The locations of boreholes and wells for bedrock characterization are dependent both on the site geologic model and on the locations of plumes of alluvial groundwater contamination Borehole/well cluster locations shown in the work plan are based on the results of the Phase I Remedial Investigation, which included 33 boreholes, 10 alluvial wells, and 14 bedrock monitoring wells The locations of the proposed clusters are likely to be revised as the bedrock geologic model and characterization of alluvial plumes are refined, particularly if dense non aqueous phase liquids are found. However initiation of the bedrock RFI/RI field activities is not contingent on the completion of the alluvial RFI/RI field activities

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E 23 Section 8.2.2	This section should include a table containing all information on samples/analyses to be taken/performed If it is well thought through and properly designed, a table of no more than a few pages can be provided that will enable the field geologist to see at a glance what samples (by number) are to come from each hole, and what analyses they should be scheduled for Again, we stress this plan is supposed to be used in the field, not merely filed to satisfy regulatory requirements Make it simple clear and complete the field crew will do a better job and thank you for it As an example this section mentions what high concentrations on the field GC might mean, but it never says what to do when the instrument registers high readings	A table containing the level of detail suggested will be prepared prior to the field activities by the subcontractor that will implement the work plan, as it has been done for the alluvial RFI/RI work plan implementation However inclusion of such detail in the work plan is beyond the purpose of the work plan. The work plan is intended to be a scoping document and field management plan. Figure 8-3 has been added to help summarize and clarify the criteria for sampling in boreholes Field head space measurements will not be used
E 24 Section 8.2.2, Page 8-17	The last paragraph of this section indicates that in some instances boreholes not previously scheduled for completion as wells may be completed, if it can be shown that his action "will not increase the chances of cross-contamination. First, headspace testing with a GC does not establish that contamination isn t present it only gives an indication of presence/absence of selected compounds six of them in this case The plan must specify methods for identifying other types of contamination. Second, we have been told by DOE that field conditions make it impossible to construct wells in boreholes which extend beyond the target zone please explain why this is no longer true Most importantly some accounting must be provided as to what advantage will be gained by attempting borehole completion given alleged technical and logistical obstacles The statement is made that "wells may be completed in boreholes This necessitates accompanying statements as to when and where this will happen, why it is necessary and who makes the decision to abandon or complete a hole	Field head space measurements will not be conducted as a basis for selecting well screen intervals Rather well screen intervals will be selected based on lithology observable free water and visible effective porosity (i e degree of weathering/fracturing) SOPs have been approved that will allow the completion of monitoring wells in boreholes If a borehole is properly grouted below the screened interval of a monitoring well, there is no reason a well cannot be constructed in the hole above that level. Similarly if the screened interval is properly isolated from potential cross contamination from above a well may be constructed in a borehole In some cases, it may be more economical to prepare a borehole for well installation by overdrilling (increasing the diameter) and installing a surface casing to near the top of the screened interval than it will be to abandon the borehole offset and construct the well in a separate hole The EG&G RI manager will make these decisions In any case drilling and abandonment of boreholes and construction of wells will be in accordance with the approved SOPs

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E 25 Section 8.2.2 Page 8-18	This section appears to contradict earlier statements that pump-out or bail-down tests will not be used because they are impractical under prevailing field conditions Please explain	The earlier statements refer to practical limitations of multi well aquifer tests in low permeability formations The pump-out, or bail down, test referred to is a single well recovery test utilized since packer tests will not be conducted at the screened intervals of holes drilled for well completions
E 26 Section 8.2.3, Page 8-19	If the interface probe is only used in wells where headspace GC indicates contamination, DNAPLs (the most likely contaminants according to your analysis) will be missed completely The procedure for identifying and sampling DNAPLs needs re thinking	The most likely contaminants to be found are volatile organic compounds which, at high enough concentrations, can exist as dense non aqueous phase liquids (DNAPLs) This does not mean it is likely to encounter these contaminants in a non aqueous phase at RFP In fact, DNAPLs have never been found in wells at Rocky Flats and the concentrations of volatile organic compounds that have been measured in the groundwater indicate that it will be unlikely to encounter DNAPLs except for a few localized areas where relatively high contaminant concentrations have been measured At concentrations high enough for DNAPLs to be able to exist, they are likely to be encountered by the field screening procedures used. The problem with detecting DNAPLs is that they tend to reside in localized pockets or in depressions in the bottom of an HSU There are no practical methods for detecting them remotely Therefore they are not detected unless they are drilled through However if they are drilled through, they are usually relatively easy to detect using the procedures described in the work plan and SOPs
	SOPs for the two alternative completion methods (which are curiously not mentioned anywhere else) must be included in either the SOP or SOPA, and must be referenced here	Agreed. An SOP will be prepared for installation of piezometer and porous stone type isolated samplers (e g., BAT system sampler)

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E 27 Section 8.2 4	This must be coordinated with the (yet to-be developed) SOP for surveying.	An SOP for surveying has been prepared. Section 8.2 4 has been revised to reference SOP GT 17 Land Surveying
E 28 Section 8.2.5, Page 8-20	This appears to be an excerpt from the contractor s scope of work, and is not appropriate here What would be of interest is how EG&G plans to collect, maintain, and evaluate field data This includes record keeping, QA/QC reporting and availability storage/retrieval, and correlation of field with analytical data much of this should be in the QAPjP/QAA, and can be referenced or summarized here	Subsection 8 2 5 has been revised to reference the appropriate QA/QC procedures that are contained in the QAPjP and QAA
E 29 Section 8.3.1.1	If only designated samples are to be analyzed, when, where how why and by whom such designation gets made must be clearly specified in the plan	The samples to be analyzed are designated in subsection 8 2 2 Figure 8 3 has been added to the work plan to summarize and clarify sampling requirements
E 30 Table 8-2.	This table is not strictly necessary here it could at least be reformatted to take up less space	The table has already been reformatted to take up less space than in previous work plans. To stay consistent with other work plans, the table has been left in
E 31 Table 8-3 & 8-4	These tables, (and the associated text) should appear in the QAPjP Any adjustments to the standard information made for the OU2 Phase II effort should be documented in the QAA. Placing the same information in too many places (and that not consistently see VOA preservation and holding times) invites confusion and contradiction Tables 8-3 must specify the analysis method to be used, by EPA method number where applicable i e 624 625 8240 8270 per SW 846	Agreed. This information is presented in the QAPjP and QAA and has therefore been omitted from this work plan

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E 32 Section 9.0	It was EPA s understanding that the QAA would contain only that information which differed from the QAPjP a different rate of QC sample collection, or a change in validation procedures for instance as dictated by conditions or sampling objectives within a specific OU Thus if everything was to be done according to the QAPjP there would be no QAA. Most of what appears here contradicts that expectation Please explain how the plans for use of QAAs have been changed, or revise this one in accordance with the Final QAPjP	The QAA has been deleted from the work plan and will be submitted to EPA and CDH as a control document under separate cover Section 9 0 of the work plan has been revised to consist of a brief summary of the contents of the QAA The intended purpose of QAAs has not changed. The QAA is a supplement to the QAPjP which addresses additional and site specific QA controls and requirements that are applicable to each individual work plan In preparing the QAAs, it became obvious that some QA requirements, controls, and actions were going to vary from OU to OU These include such issues as organization, applicable SOPs, field QC samples, analytes of interest, sample matrices, DQOs, test controls, etc. Even though the generic QA requirements, controls, and actions addressed in the QAPjP cover these issues as a whole, we felt it appropriate to present these in each QAA since they will vary from OU to OU For example, the QAPjP lists all RFP Environmental Restoration Program SOPs, but not all these SOPs are always applicable to the specific work being done at a particular OU Therefore the applicable SOPs, which have been presented as a whole in the QAPjP are referenced in the QAA For instance, the surface water sampling SOPs are not applicable to the OU2 Bedrock investigations therefore they are not included in the listing of applicable SOPs in the OU2 Bedrock QAA. The same applies to the analyte/analytical method/DQO table We feel that presenting this site specific information is appropriate and intend to continue to do so

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E 33 Section 9 12.2	Table 9 1 does not show methods, as stated what s more the work plan (Section 8) indicated analyses would be done according to the GRRASP Please provide a consistent listing of specific methods by number and reference	Table 9 1 references methods specified in the EPA s Contract Laboratory Program Statement of Work or for those analytes that have not had a method specified in the CLP SOW a specific method is referenced (e g Method 160.2 from EPA s Methods of Chemical Analysis for Water and Wastes for total suspended solids) The reason these methods were selected for analysis is because they are specified in the GRRASP The revised version of the QAA contains Section 3.3 which addresses analytical procedures and states that the analytical methods specified in the GRRASP shall be adhered to and that they are presented in Appendix A (which was Table 9 1)
E 34 Section 9.3.2.	Section 8 0 only covers subsurface soil and groundwater are other types of samples being taken?	Section 3.2 of the revised QAA accurately reflects the proposed sampling in the work plan (i e sampling is limited to subsurface soil and groundwater samples and SOPs that are applicable to obtaining and handling those samples)

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CITATION	COMMENT	DISPOSITION
E 35 Section 10 2	This description of field GC use is extremely weak as it stands During revisions either this SOPA or the associated SOP (3 9 is referenced, but covers primarily PID and FID use) must be revised to provide a complete description of the equipment and procedures to be used for headspace analysis. This should include but not be limited to 1 Instrument(s) model and pertinent features such as isothermal oven, 2. Compounds for which standards will be prepared, and procedures for preparation or commercial sources 3 Standard and conditional intervals for running machine and sampling train blanks and 4 Procedures for preventing/purging contamination, particularly cross contamination between consecutive samples The plan indicates that a great deal of decision making will hinge on the results of the field GC work A one page statement to the effect that the (unidentified) instrument should be operated according to the instruction manual hardly seems like sufficient guidance for so critical an activity	Field GC headspace screening will not be conducted as a basis for selecting well screen intervals The selection of well screen intervals will be based on lithology observable free water and visible effective porosity (i e degree of weathering/fracturing)
E 36 Section 2.1 Introduc tion		No response required
E 37 General Comment	This section frequently references Figure 1 7 as Figure 1-6 This should be corrected in the final document Rationale Correct reference to appropriate figures facilitates use of this document	The work plan has been revised to refer to correct figure numbers

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CITATION	COMMENT	DISPOSITION
E 38 Specific Comments		No response required
E 39 Page 1 2, Figure 1 5	The lithology description at the base of the Laramie Formation has been incorrectly labeled claystones in this Figure This should be corrected to sandstones in the final document Rationale The figure needs to be corrected to correspond to discussion on the text (Page 1 15 Paragraph 3)	The figure has been revised accordingly
E-40 Page 1 15, Paragraph 3	This paragraph states that the upper claystone in the Laramie Formation is greater than 700 feet thick However this is not in agreement with the local stratigraphic section shown in Figure 1 5 (page 1 12) Figure 1 5 indicates that the upper claystone is 407 thick and that the entire thickness of Laramie Formation is 692 feet This discrepancy should be resolved Rationale Consistency between figures and text discussions increases the utility of the work plan.	The text in Subsection in 1.3 2.3 addressing the Laramie Formation and Fox Hills Sandstone has been revised to indicate that the Laramie Formation is approximately 700 feet thick (692 feet) Therefore it follows that if the upper claystone interval is 407 feet thick, the lower Laramie is 285 feet thick.
E-41 Page 1 19, Figure 1 7	Individual hazardous substance site (IHSS) number 111.8 is mislabeled in Figure 1 7 as IHSS number 118 6 This should be corrected in the final document Rationale The figures need to be corrected to correspond to discussions in the text (Section 1.4.3)	Figure 1 7 has been replaced by a more accurate IHSS map which is correctly labeled.

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CITATION	COMMENT	DISPOSITION
E-42 Site Characterization		No response required
E-43 Specific Comments		
Page 2-1, Section 2.1.1.1	The third sentence states the large paleogully starts south of the east end of the East Trenches Area. This should be corrected to the west end of the East Trenches Area. Examination of Figure 2-2 shows the paleogully beginning south of the west end of the East Trenches Area. Rationale Consistency between figures and text discussions increases the utility of the work plan	The text in Subsection 2.1 1 1 has been revised to replace the term paleogully" with the term pediment drainage It has also been revised to indicate that the large pediment drainage starts south of the west end of the east trenches
E-44 Figures 2-6A, 2-6B, 2 7A, 2 7B, 2-8A, 2-8B	These cross sections could be improved if the sections respective ends were designated on the section diagrams themselves (for example A A and so on) It would also be more accurate to portray the section lines on the index maps to reflect the true length of the section lines For example, the westernmost end of section A A on Figure 2-6A is located at well BH31-87 However the line of section for A A on Figures 2 3 2-4 and 2-5 all extend approximately 2,000 feet west of this boring. This should be corrected Rationale The addition of the section designations to the cross sections allows quicker orientation when examining the figures The adjustment of the lines of section promote faster orientation and accuracy	These figures have been revised to make them more useful (see dispositions of CDH comments on this topic)

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CITATION	COMMENT	DISPOSITION
E-45 Page 2 5, Paragraph 3	The third sentence refers to Figure 2-8 The work plan copy reviewed contained no Figure 2 8 It appears that the correct reference is to Figure 2 9 Rationale Correct reference to appropriate figures facilitates use of the document	The correct reference is to Figures 2-4 and 2 5 The text in Subsection 2 1 1.2 has been revised accordingly
E-46 Page 2 98, Paragraph 5	According to this paragraph, the only borehole with volatile organic compounds reported at or below the alluvial/bedrock interface was BH 2587 However this is incorrect A review of Table 2 10 indicates that borings 2887 3187 3987 4187 4787 and 5087 all contain volatiles below the alluvial/bedrock interface The volatile organic compounds detected are not typically laboratory contaminants nor are they reported with data qualifiers The statement should be corrected. Rationale The work plan should present an objective assessment of the available analytical data to facilitate the planning of RFI/RI activities	The referenced samples from boreholes BH2887 BH3987 BH4187 and BH 4787 consisted of bedrock from within 5 feet of the bedrock surface Therefore in accordance with Figure 1 1 they represent the upper HSU within the context of the work plan BH2587 BH3187 and BH5087 show lower HSU volatile organic contaminants The text has been revised accordingly
E-47 Section 2.3 Applicable or Relevant and Appro priate Require-ments		No response required.

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CITATION	COMMENT	DISPOSITION
Specific Comments		
E-48 Page 3-1, Paragraph 4	The statement that the work plan describes only the investigative requirements relative to bedrock groundwater in OU2 is not accurate and should be corrected The discussion of applicable or relevant and appropriate requirements (ARARs) in this section focuses primarily on ground water However the objectives of the work plan include investigating the horizontal and vertical extent of soil contamination (Table 4-1 page 4-6) In addition, procedures for investigating the extent of soil contamination are included in Section 8 0 Rationale The objectives to the work plan should remain consistent between different sections	The first sentence in paragraph 4 of Subsection 3 1 has been deleted
E-49 Section 2.4 Data Needs and Data Quality Objectives	No technical comments were generated from a review of this section	No response required.
E 50 Section 2.5 Remedial Investiga tion Tasks		No response required.

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CITATION	COMMENT	DISPOSITION
E 51 General Comment	Section 5 7 includes several lists (all bulleted) of technologies which have been identified for potential testing This work plan should be revised to identify the rationale or procedure to be used to decide which (if not all) technologies will actually be tested Rationale It is not possible to determine whether all the technologies identified will be included in the treatability study or whether some will be eliminated in advance	The text of Section 5 7 has been revised to reflect this comment Technologies will be identified for further screening per CERCLA. The CERCLA screening process could eliminate some technologies and identify new ones
E 52 Specific Comments		No response required.
E 53 Page 5-8, Paragraph 3	The text states that risks will be characterized for all chemicals The text on page 5-6 indicates the list of contaminants may be reduced to a list of contaminants of concern This discrepancy should be resolved. Rationale The approach to the risk assessment should be described consistently in order to understand the proposed assessment. If contaminants of concern are identified, there would be no need to characterize the risks associated with all the contaminants detected from OU2.	The list of chemicals/contaminants is being reviewed and evaluated with the EPA and CDH before reduction to a list of contaminants of concern The text of subsection 5 6 1 4 has been revised accordingly
E 54 Page 5-10, Paragraph 3	The term short time frame should be defined, since technologies apparently will be eliminated from further consideration if they are not felt to be implementable within it Rationale Unless a resulting remedial action is an interim (as opposed to a long term) measure or being performed under an emergency basis (under the National Contingency Plan) technologies should not be eliminated because of equipment lead times (within reason)	The term short time frame was intended to mean within the constraints of the IAG schedule The text has been revised to indicate that the technologies considered were required to be implementable within a relatively short time frame opposed to technologies that would require a research and development phase

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CITATION	COMMENT	DISPOSITION
E 55 Page 5 11, fourth bulleted item	The word some or certain should be added as an adjective to describe those semivolatile contaminants which are amenable to air stripping. The sentence as worded presently in the work plan, could mislead one to believe that air stripping is a good technology for all semivolatile contaminants Rationale Not all semivolatile contaminants are amenable to air stripping. In fact for semivolatile contaminants, each compound must be evaluated for predicted effectiveness on an individual case basis.	Agreed The text has been revised accordingly
E 56 Page 5 12, first bulleted item	The last sentence regarding the large amount of sludge generated is a blanket statement which should be deleted or revised. The amount of sludge generated is directly proportional to the levels of contamination If the levels of contaminants are relatively low the sludge volume may be low Rationale Evaluating technologies using faulty reasoning could possibly result in eliminating an appropriate technology for the wrong reason	The text has been revised to indicate that in general, these methods generate sludges that require disposal
E-57 Page 5 13, third bulleted item	The last sentence regarding the large amount of solidified material generated is a blanket statement which should be revised or deleted. The volume of solidified material generated from this process is usually directly proportional to the volume of contaminated material. If the volume of contaminated material is relatively small, the solidified conglomerate volume should also be small Rationale Evaluating technologies using faulty reasoning could possibly result in eliminating an appropriate technology for the wrong reason	The text has been revised to indicate that solidification/stabilization generate volumes of solidified materials in proportion to contaminated material treated requiring disposal.

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CITATION	COMMENT	DISPOSITION
E 58 Section 2.6 Feasibility Study Tasks		No response required
E 59 Specific Comments		No response required
E-60 Page 6-2, first bulleted item	The first sentence regarding the identification and evaluation of technology options and selection of a representative process should be revised. First, it should not be the goal to select only one technology per category if there are other technologies in that category worthy of full evaluation Two options may exist within the same category and may work better together than individually or separately Second, the phrase select should be revised to recommend in reference to choosing technologies. The public and lead agency will actually make the final selection(s) Rationale CERCLA guidelines stipulate that preferred technologies be evaluated and recommended to the public for final selection Work plans for CERCLA sites should follow CERCLA guidelines.	The text has been revised to indicate that a representative process will be identified rather than selected for each technology group
E-61 Section 2.7 Schedule	No technical review comments were generated from a review of this section.	No response required.
E-62 Section 2.8 Field Sampling Plan		No response required.

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CITATION	COMMENT	DISPOSITION
E-63 Specific Comments		No response required
E-64 Page 8-13 and 8-14, Table 8-1, Cluster Numbers 11, 12, 13, and 14	The explanation of the purpose of each of these clusters implies that the hydraulic connection between different cluster locations will be determined. However statements on page 8-5 paragraph 2, specify that only single well aquifer tests will be conducted It is not clear how hydraulic communication between distant locations will be evaluated when only single well aquifer tests are planned. This discrepancy should be resolved Rationale Hydraulic communication between distant locations or stratigraphic units is usually determined through multiple well aquifer pumping tests Discussing how hydraulic communication will be evaluated is important as decisions regarding additional well placements will be made based on these determinations	Hydraulic connections between some of the different cluster locations will not necessarily be determined Rather hydraulic gradients (or apparent gradients) will be determined between wells using water level information from the wells Multiple well aquifer tests to evaluate hydraulic communication between distant locations will not be practical due to the low hydraulic conductivity of the bedrock Hydraulic communication between wells will be evaluated based largely on the apparent gradients and the geologic characterization. Additional wells may be required if the hydraulic connection is not apparent The intent is to determine hydraulic gradients, and hence evaluate groundwater flow directions, in semi confined sandstones near locations where they subcrop
E-65 Page 8-14, Table 8-4, Cluster Numbers 15 and 16	Table 8-1 indicates that monitoring wells will not be completed at cluster locations 15 and 16 A review of the existing analytical data suggests that contamination is probable in this area but that existing well control is sparse (Figure 2-21, 2-22, and 2 23) Bedrock monitoring wells should be included at cluster locations 15 and 16 Rationale Efforts should be made to enhance the completeness of the planned RFI/RI activities wherever possible	These wells were originally intended for seismic control. However wells will be added at the locations of clusters 15 and 16 at the direction of the EG&G project hydrogeologist if sandstones are encountered in the lower HSU

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CITATION	COMMENT	DISPOSITION
E-66 Page 8-16, Paragraph 3	The work plan should specify some criteria for selecting the headspace analysis sampling interval within the cored sections This information is not presented in this discussion or in the referenced SOP addendum Rationale A very small sample volume is collected for the headspace analysis (enough to fill one half of a 250 milliter container) Consequently some criteria should be specified for selecting such a small volume from a cored interval potentially 5 feet in length Scanning the core with a photoionization detector to identify areas of elevated volatile concentrations may be an alternative	Field headspace analyses will not be required by the work plan.
E-67 Page 8-17, Paragraph 3	This paragraph lists the geophysical logs that should" be run The work plan should specifically identify the geophysical logs that will be run or describe the criteria that will be used to determine the suite of geophysical logs that will be run Rationale The work plan should be specific where possible This will increase the clarity of the document and decrease the potential for confusion among field personnel conducting the RFI/RI activities	The text has been revised to indicate that geophysical logging will be conducted in accordance with SOP GT 15 for borehole geophysics The suite of logs listed in the work plan will be run The text has been revised accordingly

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CITATION	COMMENT	DISPOSITION
E 68 Page 8-30, Paragraphs 3, 4, and 5	The use of distilled water for field, equipment, and trip blanks is not recommended due to the increased potential for introducing contamination from an outside source ASTM Type II reagent water is recommended for the blank samples Rationale Use of retail distilled water adds unnecessary uncertainty into the field sampling program Commercially available distilled water is usually packaged in plastic containers and would be expected to contain phthalate group chemical contaminants introduced from the plastic. Considering the effort and expense undertaken to procure the environment samples at OU2, only high quality water with documented characteristics should be used for the blank samples.	DOE concurs ASTM Type II reagent water will be used for blank samples
E-69 Page 8-31, Table 8-4	This table should be modified to indicate that trip blanks will be used for all samples to be analyzed for VOCs Trip blanks should be used to monitor shipments of both water and soil samples Rationale Trip blanks are useful to monitor contamination of soil samples as well as water samples Because acceptable soil matrix blanks are not available for trip blanks, water matrix (ASTM Type II) blanks should be used for both shipments of soil and water samples	The table has been deleted from the work plan The QAPjP and QAA address this issue
E 70 Section 2.9 Quality Assurance Addendum General Comments		No response required
E 71 1	The quality assurance addendum (QAA) should refer to the most current version of the Rocky Flats site wide quality assurance project	The revised version of the QAA simply refers to the QAPjP

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CITATION	COMMENT	DISPOSITION
	plan (QAPjP) The version cited in the QAA (August 23 1990) is out of date and should be replaced by the current (March 1 1991) QAPjP version. References to sections of the QAPjP should be revised to reflect the current version of the QAPjP Rationale Use of current document versions minimizes the potential for confusion and misinterpretation of quality assurance (QA) plans	and does not specify a version The most recent version is implied.
E 71 2	Sample container preservation, and holding time requirements are not consistent between the QAA, Section 8 0 of the work plan (the field sampling plan) and SOP 1 13 The frequency of field quality control (QC) sample collection also varies between Table 9 3 and 8-4 Rationale Requirements for sample containers, preservation methods, and holding times are critical to the effectiveness of the field sampling program Field QC samples are also an important part of the overall project quality assurance/quality control (QA/QC) program. Descriptions of sampling handling requirements and QC sampling frequency should be consistent to minimize errors that may subsequently result in the invalidation of data. Agreement concerning correct sampling requirements is necessary prior to the initiation of field activities.	The requirements for sample containers, sample preservation, and sample holding times for RFP ER program samples are specified in Tables 8-1 through 8-4 of the QAPjP and SOP FO 13 (the information in these two documents is identical) The current version of the QAA refers to Table 8-1 through 8-4 of the QAPjP However if these requirements for an analyte of interest at a particular OU were not included in the QAPjP or SOP FO 13, or if for some reason the requirement needed to be revised for some analytes at an OU this would be reflected in the QAA and possibly the work plan (however the QAA and work plan would need to be consistent) The inconsistency between the work plan, the QAA, and SOP FO 13 will be resolved for OU2 Bedrock investigations
E 72 Specific Comments		No response required.

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CITATION	COMMENT	DISPOSITION
E 73 Page 9 3 Section 9 3 1	Data quality objectives (DQOs) for field QC measurements should be included in this section of the QAA These DQOs are not contained in the site wide QAPjP Section 3 3 1 of the QAPjP states, "The field DQOs must be documented in the work plan and summarized in the QAA The QAA should be expanded to include objectives for field QC measurements such as the acceptable variance in field duplicate trip blank, and equipment rinsate blank samples Rationale Field QC samples are an important part of the overall project QA/QC DQOs for these samples should be presented and justified	Data quality controls and PARCC parameter objectives, where appropriate (PARCC parameters are not applicable to field measurements, such as well depth measurements and borehole logging) are addressed in Section 3 1 1 of the revised QAA Objectives for field QC samples are addressed in Section 3 6 1 of the revised QAA
E 74 Page 9-3, Paragraph 2.	References to Table 9 1 of the QAPjP should be corrected to indicated Table 9 1 of the QAA There is no Table 9 1 in the current (or the earlier) version of the QAPjP Rationale Consistent cross referencing promotes the utility of the QAA	Table 9 1 of the QAA has been moved to Appendix A of the QAA, and all references to this table now refer to Appendix A
E 75 Page 9 17, Section 9 3 5	The method for preparation of trip blanks should be added to this section of the QAA. Section 3.3.5 1.3 (page 3-16) of the current QAPjP refers to the individual site QAAs for the preparation of trip blanks. The QAA and QAPjP should be modified, as appropriate, to be consistent. Rationale Trip blanks are an important component of the field QC sample system The appropriate procedure for the preparation of trip blanks should be clearly described	The procedures for preparing QC field sample blanks, including trip blanks, has been added to the QAPjP and the QAA now references the QAPjP for preparation of QC field sample blanks.

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CITATION	COMMENT	DISPOSITION
E 76 Page 9 18, Table 9 2.	This list of applicable SOPs should be modified to include all current SOPs SOPs 1 1, 1 2, 3 11 4 7 4.8 4 9 and 5 1 through 5 10 should all be added to this list If the seven SOPs listed as to-be determined (TBD) are required for field work at OU2, these SOPs should be submitted for review prior to the initiation of field activities Rationale A complete list of SOPs provides necessary reference information for field operations personnel	This table (now Table 1 of the QAA) has been modified to reference only SOPs that are applicable to obtaining the types of samples called for in the OU2 Bedrock work plan All current SOPs are not applicable to the proposed sampling. For instance the surface water sampling and the environmental evaluation SOPs are not applicable to these investigations Therefore they are not included in the table
E 77 Page 9 21, Table 9 3	Footnote 4 of this table should be modified to indicate equipment rinsate blanks will be collected at a frequency of 1 per 20 samples or 1 per day whichever is more frequent Rationale More frequent collection of equipment rinsate blanks is necessary when less than 20 samples are collected during a day of sampling. This collection frequency for equipment rinsate blanks was agreed upon during a meeting between representatives of EPA, CDH, and EG&G on November 13 1990	Frequency has been changed to 1 per 20 or 1 per day whichever is more frequent

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CITATION	COMMENT	DISPOSITION
E 78 Page 9 21, Table 9 3	The field QC sample collection frequencies presented on this table do not agree with the frequencies presented on Table 8-4 in Section 8 0 of this work plan. Specific examples include Table 9 3: Collect field duplicates 1 per 20 samples or 1 per sampling event, whichever is more frequent Table 8-4: Collect field duplicates 1 per 10 samples Table 9 3: Collect trip blanks 1 per shipping shipping container Table 8-4: Collect trip blanks 1 per 20 samples, for liquid samples only Rationale Field QC samples are an important part of overall project QA/QC Descriptions of QC sampling frequency should be consistent to minimize errors by field operations personnel that may subsequently result in the invalidation of data	The frequency of field QA samples for each OU will be specified in the QAA, which may or may not be a duplication of the QAPjP depending on the specific needs associated with the investigations of each particular work plan The discrepancy between the work plan and the QAA will be resolved
E 79 Page 9 22, Paragraph 2	This section describing data validation should be expanded to included field sample DQOs (Table 9 1) as criteria for data validation. These criteria for field data validation are in addition to the requirements described in Section 3.3 4.2 of the site-wide QAPjP Rationale Collected data must specify appropriate DQOs to be valid.	See response to Citation E-73, above While the QAPjP does not specifically address field data validation, the validation requirements do address acceptance criteria for QC samples, achieving detection limits, and equipment/instrument calibration, which are applicable quality controls for field data.
E-80 Page 9 24, Paragraph 4	The reference to requirements for the control of purchased items and services in the QAPjP should be changed from Section 9 0 to Section 7 0 Section 9 0 of the QAPjP (both versions) discusses control of processes. Rationale Correct cross references minimize the potential for misunderstandings.	The reference has been changed to Section 7 0

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CITATION	COMMENT	DISPOSITION
E 81 Page 9 25, Paragraph 1	The reference to requirements for sample volumes, containers and preservation should be changed from Table 702 to Table 8-3 Section 7 0 of the work plan discusses the project schedule Rationale Correct cross references minimize the potential for errors in the use of the work plan	The reference to these requirements is now to Tables 8-1 through 8-4 of the QAPjP The requirements will be removed from the work plan, with a reference to the QAA, which in turn references the QAPjP unless otherwise noted in the QAA (Also see response to Citation 71 2, above)
E-82 Page 9 27, Table 9-5	The sample container preservation, and holding time requirements presented on this table do not agree with the requirements presented on Table 8 3 or those listed on Tables A 1 through A-4 in SOP 1 13 Table 1 presents specific examples of inconsistencies between the three tables These tables should be modified to be consistent [Note some of the inconsistencies do not create problems For example if a 200-milliliter (mL) sample is required for bicarbonate analysis and 500 mL is required to be collected, the quality of the analysis will not be affected.] In cases where samples for several analytes are combined into one sample a footnote in the table should indicate the required sample volume reflects volume requirements from several analysis methods For example two 1 liter (L) bottles may be required for all anion analyses. This 2 liters may reflect the need for a 500 mL sample for each of four individual anions Rationale Requirements for sample containers, preservation methods, and holding times are critical to the effectiveness of the field sampling program Agreement concerning correct sampling requirements is necessary prior to the initiation of field activities.	See previous response and response to Citation 71 2, above

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CITATION	COMMENT	DISPOSITION

TABLE 1

ROCKY FLATS OPERABLE UNIT 2
VARIATIONS IN SAMPLING REQUIREMENTS

	Table 9 5	Table 8 3	SOP 1.13
Water Samples			
Carbonate sample volume	500 mL	part of 2 L	200 mL
Chloride sample volume	500 mL	part of 2 L	200 mL
Fluoride sample volume	500 mL	part of 2 L	1 L
Cyanide sample volume	500 mL	1 L	1 L
TCL VOCs sample volume	3-40 mL	2-40 mL	2-40 mL
TCL semivolatile organic compounds sample volume	1 L	1 L	4 L
TCL pesticides/PCBs	1 L	2 L	4 L
Tritium sample volume	100 mL	1 L	125 mL
Tritium holding time	none	6 months	none
TCL metals holding time for mercury	28 days	6 months	28 days
TCL pesticides/PCBs holding time to extraction	7 days	5 days	7 days
Soil samples			
Sulfide holding time	28 days	not specified	7 days
TCL metals holding time (excluding mercury)	180 days	10 days	6 months
TCL VOCs holding time	14 days	10 days	7 days
Tritium holding time	180 days	not to exceed 45 days	none

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CITATION	COMMENT	DISPOSITION
E 83 Section 2.10	No response required.	
E-84 Specific Comments		No response required.
E-85 Page 10-3, Paragraph 1.	This paragraph states that the headspace sample will be broken up in the jar The work plan should consider capping the jar immediately and breaking up the sample by agitation, especially if the sample is unconsolidated and can be easily broken up by agitation Rationale Preserving as much of the original volatile content as possible by immediately capping the sample collection jar after collection will enhance the accuracy of the headspace analyses.	Field headspace measurements will not be required by the work plan
E-86 Page 10-3, Paragraph 1	This paragraph states that the headspace analysis samples will be placed in a water bath maintained at 25 degrees Celsius The temperature of this water bath should be maintained at 50 to 70 degrees Celsius to better drive out the sample s volatile components This procedural change should be considered in the work plan Rationale Trichloroethylene (TCE) tetrachloroethylene (PCE) and hydrocarbons in general tend to become strongly bonded to clay rich matrices Increasing the temperature of the water bath will more effectively drive out these volatiles components from the soil matrices and enhance the accuracy of the headspace analyses	See disposition of Citation E 85

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DOCUMENT REVIEWER Environmental Protection Agency Region VIII **Date** June 28 1991

CITATION	COMMENT	DISPOSITION
E-87 Section 3 0 Conclu sions	Overall, the work plan appears to present a useable and acceptable approach to the completion of bedrock RFI/RI activities at OU2 Most of the technical comments generated from this review document minor problems or inconsistencies which can be easily corrected. However potential major concern is that the work plan relies on a phased approach to completing RFI/RI activities This could lead to unacceptable delays in completing the OU2 RI However review of the OU2 RI data does not indicate that additional field activities would significantly enhance the approach s completeness (with the possible exception of adding ground water monitoring wells at cluster locations 15 and 16) The progress of RFI/RI activities should be closely monitored to assure that completeness of the final RI remains an important objective and that unnecessary delays are avoided	This Phase II RFI/RI bedrock work plan proposes 20 clusters of boreholes and wells that contain a total of 20 boreholes and 38 wells These clusters represent the proposed Phase II RFI/RI boring and sampling program This program may be expanded to include additional wells screened in currently unknown sandstone units The objectives of the bedrock component of the Phase II RFI/RI are to characterize the bedrock geology and hydrogeology and to sufficiently characterize the nature and extent of bedrock contamination to support the feasibility study baseline risk assessment, and remedial design. At this time it is not known definitely whether or not contamination of the relatively deep unweathered bedrock exists The progress of RFI/RI activities will be closely monitored to ensure that the completeness of the final RI remains an important objective and that unnecessary delays are avoided

SECTION 2.0
CDH COMMENTS

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May 3, 1991

Mr Fraser Lockhart
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RE: REVIEW AND COMMENT: PHASE II RFI/RI WORKPLAN (BEDROCK) 903 PAD, MOUND, AND EAST TRENCHES (OU 2), DRAFT FINAL VERSION, JANUARY, 1991

Dear Mr Lockhart,

The Colorado Department of Health, Hazardous Materials and Waste Management Division (the Division) has reviewed the above referenced document prepared by DOE and it's prime operating contractor, EG&G The Division's comments are attached

There are some significant problems with this document that have been enumerated in the comments It is our hope that dialogue between our staff members can rapidly resolve these deficiencies and that the final version of this document will be satisfactory to all parties

If you have any questions concerning these matters, please call Joe Schieffelin of my staff at 331-4421

Sincerely,

Gary W Baughman
Unit Leader Hazardous Waste Facilities
Hazardous Materials and Waste Management Division

cc Dan Miller, AGO
Martin Hestmark, EPA
Scott Grace, DOE
Tom Greengard, EG&G
[redacted]
Barbara Barry, RFPU

DOCUMENT REVIEWED Phase II RFI/RI Workplan (Bedrock) Draft Version, 1/91
903 Pad Mound and East Trenches (OU 2)
DOCUMENT REVIEWER Colorado Department of Health **Date** June 28 1991

CITATION	COMMENT	DISPOSITION
General Comments		
C 1 1	The Draft Geologic Characterization Report (EG&G 1990a) and the Draft Task 3 Shallow High Resolution Seismic Reflection Profiling in the Medium Priority Sites (Operating Unit 2) at the Rocky Flats Plant (EG&G 1990b) are cited so many times within the text of this document that the Division may withhold approval of the final version of this RFI/RI until such time as we have reviewed the contents of these two documents There are apparent problems with the conceptual depositional model for the Arapahoe formation presented in the text which the Division feels are probably traceable to the Draft Geologic Characterization Report. The sooner that this report is submitted to the regulatory agencies, the sooner resolutions to these problems can be worked out	During the IAG negotiations, all parties agreed that the EPA and CDH would not receive interim geologic characterization reports directly but would receive the information through the individual OU work plans Therefore citations of these interim draft geologic characterization and seismic reports have been limited in the work plan The results of the geologic characterization and seismic study that are pertinent to the bedrock in OU2 are presented in this work plan These studies are ongoing and are continually being reevaluated. This process will be temporarily frozen for the purpose of the RFI/RI Report
C 1 2	If this plan, as presented, only includes the initial portions of what will comprise the final Phase II RFI/RI field implementation (as per the Executive Summary) a mechanism needs to be developed to inform the regulatory agencies of any changes or additions to the workplan. The Division cannot approve half a plan We must know more about the scope and plan for the subsequent stages of this RFI/RI workplan before approval can be granted. The Division suggests that DOE include a decision tree that explains the various options available when certain conditions are encountered	This Phase II RFI/RI bedrock work plan proposes 20 clusters of boreholes and wells that contain a total of 20 boreholes and 38 wells These clusters represent the proposed Phase II RFI/RI boring and sampling program This program may be expanded to include additional wells screened in currently unknown sandstone units. The objectives of the bedrock component of the Phase II RFI/RI are to characterize the bedrock geology and hydrogeology and to sufficiently characterize the nature and extent of bedrock contamination to support the feasibility study baseline risk assessment and remedial design. At this time, it is not known definitely whether or not contamination of the relatively deep unweathered bedrock exists. The progress of RFI/RI

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		activities will be closely monitored to ensure that the completeness of the final RI remains an important objective and that unnecessary delays are avoided. Figure 8-2 presents a decision tree that explains the various options available to redirect the RFI/RI process based on the interim results
C 1.3	The Division has determined that it is time to remedy a serious problem before the problem gets any worse or goes any farther The problem is sloppy preparation of maps and cross sections The Division is surprised and dismayed by the lack of completeness and accuracy that some of the exhibits enclosed in this document display Elementary geologic techniques and protocols have not been employed, a fact pointed out in the following comments Furthermore, this is not the first time this has been pointed out to DOE From this point on, contoured maps will not be accepted until each point used as a basis for the contours is represented by the contoured data. If maps are included without this data, the document will be rejected. This also includes cross sections without directional labels, scales, and alpha numeric labels The mission of the regulatory agencies makes accepting inadequate maps and cross sections impossible Accepting incomplete exhibits encourages further sloppy work and may ultimately cause incorrect conclusions to be drawn	The illustrations presented in the draft final document have been clarified and made more useful The map showing bedrock surface elevation contours shows elevation data and maps summarizing sandstone lithologies include interval thickness data Appendix A has been added to show borehole/well lithology information from the draft Geologic Characterization Report
C 2 Specific Comments		No response required.

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C 3 Executive Summary	Many times within this section, data that has not been validated is mentioned. Please add text explaining when this data will be validated and why it has not been validated yet	Most of the data in question were collected prior to 1989 These data were collected according to less stringent quality assurance/quality control (QA/QC) protocols than are currently in place Sufficient documentation is not available to validate these data according to EPA data validation guidelines Recent data that had not been validated at the time of work plan preparation are currently being validated or have recently been validated and should be available in the near future
C-4 Executive Summary	In reference to the last paragraph on page ES 2, the Division is concerned about the priorities of the listed objectives for this RFI/RI According to Part VI of Attachment 2 of the IAG RFI/RI Workplans should assure that each site identified in Table 1 is fully characterized and that a Baseline Risk Assessment is performed. From the text of this document, this relative priority appears to be reversed. An accurate Baseline Risk Assessment depends on a complete characterization of the sites and any contamination found therein. Please revise the text to include this concept.	The text of the executive summary has been revised to address this comment. The geology hydrogeology and nature and extent of bedrock contamination will be characterized sufficiently to support the feasibility study the baseline risk assessment, and remedial design
C 5 Executive Summary	The very last paragraph of this section mentions that what follows, in the main body of the RFI/RI workplan, only represents an initial program which will be expanded throughout the course of the RFI/RI The Division believes that this approach is a good one and will allow doe to take advantage of new discoveries and data and to capitalize on changing conditions However it is unclear how much latitude DOE is building into this RFI/RI Please explain what percentage of the budget for this RFI is being used to complete the initial program, and what percentage will be available for subsequent	See Disposition of Citation C 1.2. The text of the executive summary has been revised accordingly The boreholes and wells outlined in the work plan represent the Phase II RFI/RI sampling program which may be expanded to include additional wells screened in currently unknown sandstone units

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	investigations Also, please include an approximation of the impact that this exact budget would have in terms of number of additional wells, samples, cores, seismic, laboratory testing, etc In addition, please explain how the additional program will be proposed to and approved by EPA and the State As mentioned in the general comments, we cannot approve this plan until we understand all of it A decision tree would go a long way to explaining the "what if's	
C-6 Section 1.0	Please revise the second paragraph to indicate that the IAG has now been signed	The text of the work plan has been revised accordingly
C 7 Figure 1 5	The stratigraphic column presented in this figure depicts bedrock sandstones 1 through 5 as being continuous The Division is under the impression that this is not the case In fact, based on the current understanding of these sands, they should be shown on discontinuous and lenticular Please revise this figure	The figure is a stratigraphic column, not a geologic cross section. The sandstone units shown depict stratigraphic intervals where sandstones are found at some locations

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C 8 Section 1.3.2.3. Arapahoe Formation	The Division is aware that a debate exists over where the Lower Arapahoe ends and the Upper Laramie begins This section of the text implies that the debate is over Please summarize the resolution of the debate in the text The fourth sentence of the first paragraph needs some clarification Please describe more fully how the Geologic characterization of the Arapahoe Formation was accomplished. Was the characterization of the Arapahoe based on literature outcrop studies, core studies, seismic investigations, or a combination of all of these? Another term of unknown geologic origin is stream channel shaped structures Please clarify the meaning of this term We assume that the term refers to the opinion that the sands occurring beneath the plant seem to be paleo-channel filling sandstones	The discussions of the Arapahoe Formation in subsections 1.3 2 3 and 2 1 1 2 have been revised to contain a comment indicating that geologic interpretations are based on information from Hurr (1976) and the draft geologic characterization report (EG&G 1990a) These interpretations are subject to change or modifications based upon information gathered during the Phase II Geologic Characterization and the bedrock component of the Phase II RFI/RI for OU2. This section and subsection 2.1 1.2 on bedrock geology have been slightly revised to clarify that the channel shaped structures are fluvial channel sequences containing primarily fine grained sands and silts The basis of the characterization of the Arapahoe formation is described in subsection 2 1 1.2 and in subsection 1.5.2
C 9 Section 1.3.3	The first paragraph of this section makes reference to a 1973 Colorado Land Use Map Please use a more up-to-date source for your land use data. RFP is increasingly surrounded by suburban areas. Many would not agree with your assertion that RFP is in a rural area.	Section 1.3.3 has been revised based on a more recent land use map
C 10 Section 1.4.2.4	Figure 1-6 is incorrectly referenced in this section The correct reference should be Figure 1 7 The text indicates that there are two locations for the Pallet Burn Site shown on Figure 1-6 (1 7) We were only able to locate one location for this SWMU on the map	The figure references have been corrected The two sites reported for IHSS 154 are shown in the revised Figure 1 8

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C 11 Figure 1 9	This figure does a poor job of covering the area to be studied in this RFI/RI Please re plot this figure so that it covers a more appropriate area at a scale that allows the data presented to be deciphered.	The intent of this map is to show existing boreholes and wells and the proximity of the study area to the surrounding areas. Most of the maps in Section 2.0 show the area being studied at a larger scale
C 12 Figure 2 2.	If this figure represents the top-of bedrock surface why are contour highs indicated beneath the perimeter road and the PSZ boundary as they cross the bottom of the South Walnut Creek drainage? This could be a coincidence but we doubt it There is no data at these locations to indicate a bedrock high and regionally the creek bottoms are bedrock lows	The figure has been revised to show a more likely interpretation of the bedrock surface contours at the west end of the south Walnut Creek drainage
	The contours around well 59-89BR also display some idiosyncrasies. The map currently indicates that well 59-89BR sits on a bedrock high that runs SSE. No other structure in this area displays this orientation In fact, almost all structures have either an E W or a NE-SW orientation in this area. Therefore, while the version presented is possible, perhaps a better interpretation would change the structural orientation in the vicinity of well 59-89BR to more closely match the surrounding trends	The bedrock "high under well 5989 BR is based on the current working geologic model contained in the draft geologic characterization report The figure has been revised to clarify certain contours and a note has been added to indicate that contour intervals are 10 feet and 50 feet
	In addition, there is not a consistent contour interval between contour lines on this map In some places the interval is 10 feet, in others, it is 50 feet We are sure that this was done because of relative data density in different areas. However when this is done, it should be highlighted with lines that are more bold. The reason this is important can be seen on the northeast corner of the map There is a data point in the bottom of creek that has a value of 5876 However the 5890' contour ends prematurely and the next contour	

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	down is not labelled. If it is the 5850 contour it is placed correctly But, if it is the 5880' contour then it is incorrect Right now there is no way to tell if the map is correct Again, this is elementary map construction and the Division expects these types of problems to go away	
C 13 Section 2.1.1.2	Once again, the text implies that the Arapahoe/Laramie debate has been resolved. Please summarize how a resolution was reached	See disposition of Citation C 8
	The second paragraph of the text states definitively that the Arapahoe Formation was deposited by meandering streams and cites Weimer 1973 as a source Please give the page number for this citation on meandering streams as the Division was unable to locate it within the article In fact, on page 70 of the article the last paragraph on the page indicates that the Arapahoe was deposited when stream gradients were much higher than during Laramie deposition. High gradients are not synonymous with meandering streams On the following page (page 71) of the Weimer article a more complete discussion of the delta plain environment is presented. At no point are meandering streams mentioned.	Agreed The reference to Weimer (1973) is not correct The work plan has been revised accordingly
	Furthermore, this section of the Weimer article discusses the wide occurrence of splay deposits, particularly splay sands, within the Laramie Formation. The text of the document also mentions these types of sands (as part of the Arapahoe) These splay and overbank sands do not fit into the category of channel sandstones which the text stated was an all-inclusive category for sands beneath RFP (Section 1.3.2.3) Point bars do not fit this category either This contradiction in the geologic conceptual model needs resolution within the text	As acknowledged above the reference to Weimer in the draft work plan was incorrect. As discussed in the response to comment C-8, the geologic interpretations presented in the work plan are based on Hurr (1976) and on the ongoing geologic characterization study However the geological characterization study considered the depositional model presented in the Weimer article and will continue to do so as the RFP bedrock geologic model is updated.

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	The descriptions of various sand body types presented in the remainder of the second paragraph of the text are fine but they do not agree with the sand thickness isopachs on Figures 2 3 2-4 and 2 5 These figures imply major channel filling sands and do not account for point bars, splay deposits, or over bank deposits Make the maps more definitive and include the subsidiary facies It is also important to emphasize that, as presented in the last sentence of this paragraph, channel fill deposits form in the manner indicated, but channel filling sands do not Meandering streams leave within the rock records, extensive channel fill deposits and point bar deposits, but do not leave extensive channel filling sands Again, this is not what the maps indicate It is also difficult to include in a meandering stream environment and rock record the pervasive amounts of splay overbank, and flood plain deposits present in the RFP bedrock It is not difficult to place all these depositional facies in to a deltaic environment In fact, splay sands are by definition, deltaic. The word delta, however is never used in the description of the bedrock geology within this document.	The comment has been noted The data from the proposed boreholes will be evaluated considering these depositional facies
	Throughout the remainder of this section, careful attention needs to be paid to the use of the terms channel sand channel deposit" channel fill, and channel These terms, and the misuse thereof, contribute to a poor understanding of the text Perhaps using these terms in a more precise manner will force some re-thinking of the meandering stream concept and make the description of the stratigraphy more clear in the text	The terminology has been revised to reflect that channels shown in Figures 2 3 2-4 and 2 5 are channel shaped fluvial sequences composed of predominantly fine grained sands and silts. The limits shown on these figures are the approximate lateral limits of zones of aggregated stream channel deposits, not the edges of a single channel event
C 14 Figure 2-3	Please place the sand thickness values that were used to construct this map next to the well and borehole locations. This is not the first time that the Division has asked for this to be done and, unless map	The figure has been revised to address the comments

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	making for DOE changes, it will not be the last Putting datums next to the data point is a basic geologic map making technique that the State expects to see utilized in all Rocky Flats documents	
	The importance of using this technique is illustrated by the fact that this map on Figure 2 3 does not concur with the data presented in Table 2 1 Wells 24-87 and 57-89BR along with boreholes BH40 87 and BH41-87 are shown to be well within the sand body of sandstone #1 However none of these wells or boreholes show that sand was penetrated in the equivalent stratigraphic position on Table 2 1 Assuming that Table 2 1 is correct (is it?) had these values been plotted on the map the sand isopach would have been drawn differently	Well 24-87 BH 40-87 and BH 41 87 did not penetrate deep enough into the bedrock to determine if the Arapahoe sandstone #1 is present Results of well 57-89BR were not available for the geologic characterization at the time the draft was prepared. The final geologic characterization is still in preparation and will presented in the RI report Refer to Appendix A
	While we are on the subject of Figure 2 3 the Division feels obligated to comment further even though this figure is not really a part of this document since Sand #1 is in the upper hydrologic unit Part of the sand body shown on the map is labeled Ox Bow" and is implied to be filled with sand. If this was a meandering stream environment, an ox box, or abandoned channel cut-off, would not be filled with sand. Ox bows are the result of the active channel cutting across the neck of a meander in a rapid change of channel course Immediately after cut off, this abandoned portion of the channel is empty of sediment (except, perhaps, a coarse channel lag) and is only filled with water The resulting ox bow lake is an extremely low energy environment that fills with mud, silt, and organic matter and very little sand.	The term Ox bow has been deleted. This feature is representative of a fluvial depositional environment

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	The sand body shown on Figure 2 3 implies a meandering stream depositional system It also implies a 400 wide channel which is very big river! If this was a meandering system please explain why the meanders are not filled with large point bar sands (i e., there should be a large point bar under the solar ponds and mound area, another under well 35-86, and another under ponds B 1 and B 2)	This figure depicts stream channel deposits that are aggregated or stacked together in a zone in the subsurface rather than a single channel The proposed data collection will consider existing geologic models to characterize channel geometry
C 15 Figure 2-4	Please place datums next to the well locations used to construct this isopach	Data have been placed next to borehole and well locations
	Outlines for potential sand #2 subcrops are shown on the southern portions of this map Please explain why these outcrops are not continuous across the contoured limits of sand #2 If the contours are correct, then there should be a continuous subcrop between the two zero contours where the bedrock surface intersects the sand.	Subcrops are not shown to be continuous across the stratigraphic interval of the Arapahoe Sandstone #2 because it is not believed that sandstone occurs continuously throughout this stratigraphic interval
C 16 Figure 2 5	Please place datums next to the well locations used to construct this isopach	The figure has been revised to include data at the borehole and well locations used to construct the figure
	Why is the seismic anomaly shown on figures 2-4 and 2-5? Which sand actually showed the anomaly?	As discussed in the second from the last paragraph in Subsection 2.1 1.2, there appears to be a potential for the sandstones inferred from the seismic work to correspond to the Arapahoe sandstone numbers 3 through 5 intervals. Boreholes and geophysical logging at these locations are planned to help correlate seismic velocities with lithology The seismic anomalies are shown in Figures 2-4 and 2 5 since those figures summarize the stratigraphic intervals believed to be represented by the anomalies

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	This map has the same subcrop problem commented on previously	Again, the subcrops are not shown to be continuous because sandstones are not believed to occur continuously throughout the referenced stratigraphic intervals.
C 17 Figures 2 3, 2-4, and 2 5	The Division suggests that these exhibits be reconstructed into a penetration format This would involve removing all well spots on a map that do not penetrate to the depth of the zone of interest This allows for a more precise presentation of the data and keeps the data from getting lost in a cloud of well control that is irrelevant because it is not deep enough The Division also recommends that the cross section and seismic line locations be removed from all of these isopach maps and placed, by themselves, on a separate map For further data presentation enhancement, we suggest that the sand bodies be shaded and that wells screened in the particular sand being mapped be high lighted These data presentation methods will improve the communicability of the exhibits and more clearly show where additional data is needed.	Figures 2 3 2-4 and 2 5 have been reconstructed into a penetration format However a separate map has not been developed for the sole purpose of showing the cross section locations We believe the figures as presented in the final work plan are more understandable and useful than the draft figures
C 18 Figures 2 -6, 2 7 and 2-8	While the Division recognizes the value of presenting cross sections on a one-to-one scale these figures, as presented, are almost worthless. Please re-draft these in a compressed horizontal scale so that they are easier to visualize and can be seen completely on one fold out page	Exaggerated vertical scale cross sections can be misinterpreted and imply hydraulic gradients greater than they actually are A 1 1 (true scale) is therefore used to avoid these misinterpretations These figures are still presented on 11 x 17 inch format as a result of constraints related to reproduction of color graphics

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	Standard presentation of cross sections include both a vertical and horizontal scale alpha numeric label identification of the cross section at the ends, and compass directions at the ends For example a hypothetical cross section A A that runs north south should have an A and the word North on one end, and an A and the word South on the other end. The Division is surprised an dismayed that these basic construction techniques need to be pointed out	The reference to alpha numeric labels is unclear However the final figures have been revised for clarification
C 19 Figure 2 9	Figure 2-9 could be deleted from the text	Figure 2 9 has not been deleted. DOE believes that an understanding of the shape of the bottom of the upper HSU is important in the evaluation of potential lower HSU sources and recharge areas
C 20 Table 2 1	Not all of the wells and boreholes shown on this table could be located on the maps. In addition, not all the wells and boreholes shown on the maps could be located on the table For example wells 11-87 11-87A, 13-87 and B315289 were on the maps but not on the table, and wells 59-86, 03-87 05-87BR, 07-87BRA, and others were on the table but could not be found on the map Please remedy this situation.	All of the wells shown in Table 2 1 are located on the maps. However there are many alluvial boreholes and wells shown on the maps that are not included in Table 2 1 since they were not used for evaluating the bedrock.
	Also a separate column for well or borehole depth needs to be added. In addition, stick diagrams of the gross lithologies presented at the same vertical scale as the cross sections on Figures 2-6 2 7 and 2-8 would be very helpful.	The column that originally showed the depth intervals of claystone and siltstone has been replaced with a borehole/well total depth column. However stick diagrams summarizing lithology have not been prepared for all of the wells, although such stick diagrams are presented for selected

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		wells in Figures 2 12 through 2-20 Appendix A has been added to the work plan to summarize lithology
C 21 Section 2.1.2.1	As this subject has been thoroughly discussed in the alluvial portion of the workplan, it is the Division s opinion that this section does not need to be included in the bedrock volume This would include Figures 2 10 and 2 11	An understanding of the groundwater regime in the upper HSU is important as far as understanding potential recharge to the lower HSU Therefore the summary of the upper HSU groundwater flow system has been left in the work plan Figure 2 10 shows the proximity of seeps to potential subcropping sandstones Figure 2 11 provides an indication of groundwater head above the lower HSU
C 22 Section 2.1.2.2.	Please present, as a part of this section, any hypotheses that have been expounded as to why there is an apparent vertical gradient in the bedrock at RFP	Steep downward vertical gradients are often found in the topographically elevated portions of groundwater flow systems where the shallow surface materials are relatively high in hydraulic conductivity (which typically leads to high rates of precipitation infiltration) and the deeper strata are of relatively low hydraulic conductivity
C 23 Section 2.2	There are some problems with Tables 2-2, 2-3 and 2-4 First, what is the difference between Tables 2 2B and 2-2D? Also what is the difference between Tables 2 2B and 2-4B? In addition, contrary to the text on the previous page weathered claystone data is presented on Table 2-4 There are three pages to Table 2-4 and an explanation of the differences between them is necessary	Table 2 2B (Table B 1C in final work plan) presents chloride data for North Rocky Flats while Table 2 2D presents chloride data for South Rocky Flats The Plant was divided in half by a north south groundwater boundary defined in the Geochemical Characterization Report as the hydrologic groundwater divide between the Walnut and Woman Creek drainages North and South Rocky Flats are similar in groundwater geochemistry for all analytes except chloride For this reason, chloride results are presented separately while data for other constituents are combined The heading for Table 2-4B (Table B 3D in final work plan) was incorrect. The heading should have read STATISTICS FOR

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		CHLORIDE CONCENTRATIONS IN BACKGROUND SOUTH ROCKY FLATS UNWEATHERED SANDSTONE GROUNDWATER SAMPLES Results are provided for weathered claystone, weathered sandstone and unweathered sandstone, but not for unweathered claystone Very little data is available for wells screened in unweathered claystone because they frequently do not produce sufficient quantities of water for sampling.
C 24 Tables 2 5A, 2 5B, and 2 5C	Put in a set of maps showing the locations of each of these collection points	The locations of these collection points are shown in the Background Geochemical Characterization Report for 1989 Reproducing them in this work plan is unnecessary
C 25 Figures 2 21, 2 22, and 2 23	Please put the datums next to the well locations on these maps	These plume maps are from the alluvial work plan and summarize data in the upper (alluvial) HSU This information is presented in detail in the Phase I RI report and in the Phase II alluvial work plan
C 26 Section 2.3.2.	Reference is made in the text to wells 774 and 2274 The Division was unable to locate these wells on any map Please include a map showing the location of these wells, particularly since they may be contaminant cross-flow locations	The locations of both of these wells are shown on several of the maps Well 7 74 is indicated by a triangle symbol just south of the south boundary of the east trenches approximately 600 feet west of the southeast corner of the east trenches area. Similarly well 22 74 is also marked with a triangle symbol approximately 250 feet east and 100 south of the southwest corner of the east trenches area.
C 27 Table 3-1	The ARARs proposed in this table show a significant amount of inconsistency with previously submitted documents. This is true both for the specific ARAR values and for the chemical compounds for	Specific ARARs are proposed based on the most stringent standards applicable to groundwater Chemical compounds for which ARARs have been proposed are based upon those

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	which ARARs have been proposed The following paragraphs outline the inconsistencies by chemical compound group	chemical compounds that have been detected at levels above detection limits in the bedrock groundwater at OU2 ARARs will be proposed for additional chemical compounds if future analytical results identify other chemical compounds above detection limits
	By way of general comment, it is the Division s opinion that the surface water standards promulgated by the Colorado Water Quality Control Commission are relevant and appropriate for this RFI/RI because any recovered contaminated water within this OU will probably be released into the surface water environment after treatment Therefore we have recommended that the ARARs be changed to reflect this	If treated groundwater is released into surface water the resultant mixture will then be considered surface water and will accordingly attain surface water ARARs Untreated groundwater remaining in the ground after treatment, or groundwater reinjected after treatment, will attain groundwater ARARs Table 3-1 presents proposed ARARs for bedrock groundwater exclusively
	As additional general comment to the ARARs, we suggest the generation of a table in this RFI/RI similar to Table E 2 in the OU 2 Surface Water IM/IRA for South Walnut Creek This table included all the possible regulatory sources for ARARs and allowed a comparison of these levels for each chemical compound. A table like this would be very helpful in this document	It is unnecessary to include a table such as E 2 in the Surface Water IM/IRA for South Walnut Creek since there are no negotiated final ARARs presented in this document Therefore there is no identified need to include such a table The purpose for ARAR identification in this work plan is not only to identify proposed ARARs at the early stages of the RFI/RI process, but to identify target detection limits for sampling activities conducted under this work plan

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	(Compound-Specific Comments) **Organic Compounds** The following changes to the ARARs listed need to be made **Compound** / **ARAR** / **Comment** Tetrachloroethylene / 1 0U ug/l / WQCC surf wtr std Chloroform / 1 0U ug/l / WQCC surf wtr std	Response to CDH Compound Specific Comments Since Table 3-1 addresses proposed ARARs and TBCs for confined bedrock groundwater in OU2 exclusively there are no amendments made to this table to incorporate surface water standards, except as TBCs when no ARARs are available Standards for vinyl chloride 1,1 dichloroethane 1,1 dichloroethene 1,2 dichloroethene 1,1 2,2 tetrachloroethane 1 1 1 trichloroethane cobalt, and vanadium were not included in Table 3-1 because existing data for these compounds were not found at or above detection limit in the OU2 Phase I RFI/RI investigation for bedrock groundwater Throughout the RFI/RI process, additional ARARs/TBCs will be proposed as new data identifies concentrations for any compounds detected at or above their respective detection limit in OU2 bedrock groundwater Accordingly carbon disulfide was included in Table 3-1 since it was identified at detection limit in OU2 bedrock groundwater

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The following organic compounds appear in either the OU 2 IM/IRA or the OU 2 Alluvial RFI/RI and need to be added to this workplan.

Compound	ARAR	Comment
Vinyl Chloride	2 ug/l	WQCC surf wtr std
1,1 Dichloroethane	5U ug/l	
1,1 Dichloroethene	7 ug/l	
1,2 Dichloroethene	5U ug/l	
1 1,2,2 Tetrachloroethane	1 0 ug/l	WQCC surf wtr std
1 1 1 Trichloroethane		

In addition, the Division would like to know why an ARAR has been proposed for Carbon Disulfide

Metals The following changes to the ARARs listed need to be made

Compound	ARAR	Comment
Aluminum	0 15 mg/l	WQCC aqua. life std.
Beryllium	0 10 mg/l	WQCC agricult std.
Copper	0.20 mg/l	WQCC agricult. std.
Lead	±0 005 mg/l	WQCC aqua. life std. (hardness dependent)
Magnesium	background	background TBC
Mercury	0 0002U mg/l	WQCC aqua life std
Molybdenum	0 1 mg/l	WQCC agricult std
Strontium	background	background TBC
Zinc	±0 025 mg/l	WQCC aqua. life std. (hardness dependent)

(See response to CDH Compound Specific Comments)

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	The following metals appear in either the OU 2 IM/IRA or the OU 2 Alluvial RFI/RI and need to be added to this workplan. **Compound** / **ARAR** / **Comment** Chromium III / 0 01 mg/l / WQCC aqua. life std Chromium IV / 0 01 mg/l / WQCC aqua. life std. Cobalt / 0 05 mg/l / WQCC agricult std. Vanadium / 0 1 mg/l / WQCC agricult std **Radionuclides** The following changes to the ARARs need to be made **Compound** / **ARAR** / **Comment** Gross Alpha / 7 pCi/l / The Woman Creek standard would apply unless it is known that treated water would only go to Walnut Creek, in which case 11 pCi/l would be the ARAR. Pu 239 240 / 0 05 pCi/l / WQCC surf wtr std. H 3 / 500 pCi/l / WQCC surf wtr std.	(See response to CDH Compound Specific Comments.)
C 28 Table 4-1	An additional bullet under the "Data Need heading needs to be added to the second page of this table. It should read Evaluate old boreholes and determine their role in possible cross-contamination.	Table 4-1 has been revised as suggested.

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	This is mentioned in the first bullet on the second page but is important enough to be a separate item	
C 29 Section 5.6	It would be very helpful to add a matrix to this section that identifies all of the parameters needed to calculate the baseline risk assessment and which equations will be used, and shows how the data will be gathered that satisfies the requirements of these equations	Developing a matrix as suggested would be beneficial, however it would be premature considering that exposure pathways have not been fully identified All equations employed in computing risks in the risk assessment will be patterned after those presented in Risk Assessment Guidance for Superfund (RAGS) Thus, RAGS parameters will generally be employed. In the case of human dose function parameters (intake rates, body weights, etc.) standard literature sources such as Exposure Factors Handbook and Annals of the International Council on Radiation Protection (ICRP) will be employed. Intermedia transfer coefficients (distribution coefficients, etc.) will be developed using site specific data and relevant literature sources It is anticipated that EPA and CDH will participate in the identification of input parameters (and pathway identification) utilized in the risk assessment through their review and comment on the Technical Memoranda required by the IAG as well as through the risk assessment working group
C 30 Section 5.6.1.2.	Please explain the difference between the third and fourth bullets under the exposure assessment process section on page 5-6 Also the sixth bullet should have the word "levels replaced by the words concentrations and intakes	Bullet four is an expansion of the third. From a conceptual model perspective a pathway is complete if the contaminant can be transported from a source to a receptor This is conveyed by the third bullet Once the pathway is completed, receptor exposure may occur under various scenarios For example, if groundwater reaches a residence (a complete pathway) exposure scenarios could include routine ingestion,

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		periodic ingestion, exposure via showering, exposure by ingestion of vegetables affected through root uptake etc.
C 31 Table 8-1	The following comments to Table 8-1 should be considered while using Figure 8-1 This table represents the heart of this RFI/RI and the Division feels that it is a good plan However we also feel it could be improved. We recognize that some of our suggested improvements will cost additional money We are not sure of the impact this will have on the overall budget for this RFI/RI but are sure that feedback to these comments will make this clear First, as a general comment, the Division is concerned that, because the bedrock sands are not well understood and their subsurface locations might be hard to track down, as much data should be gathered at their known locations as is possible For this reason, we have proposed drilling twins to wells and/or boreholes where the original hole drilled sand at a particular level, but is either plugged or screened in a different zone These are locations where there is very low risk of sand occurrence, and where the data could be very useful. Second, we have suggested a slight relocation of several of the well nests for the same reason presented above If the Division felt that a particular well nest was located with an inordinate amount of dependence on the geological model, we have recommended moving the location to a point where the model plays a lesser role in predicting success for the objectives of that well nest. It is the opinion of the Division that over-dependence on any geologic model,	It is agreed that all 20 of the boreholes at the 20 well/borehole cluster locations should be drilled to the stratigraphic equivalent of the Arapahoe Sandstone No 5 and the work plan has been revised accordingly However DOE believes that additional well clusters are generally not required Individual wells may be added to monitor unexpected sandstones The investigation proposed will be very costly as a result of the well and borehole depths and SOP requirements, therefore DOE believes it will be prudent to avoid additional well installation unless interim results indicate additional wells are required to fill data gaps

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	regardless of its superiority is unwise at this early point in the investigation Third, we suggest that all 20 of the initial boreholes be drilled to at least the stratigraphic level of sand #5 As many of these locations do not have data to this depth, the additional cost of the drilling is minimal compared to the stratigraphic control that will result	
C 32 Cluster #1	It is stated that one of the purposes for this nest is to evaluate vertical gradients Please explain how this will happen if the nest will only include a screen in one sand (sand #2) Also please explain what happens if no sand is found in the deeper stratigraphic levels of this location The Division recommends moving this location 150' to the south or southwest As it is presently located, this nest will miss the interpreted locations of all deeper sands The closer to well B217589 which had sand #4 the better	Cluster #1 is located near well 36-87 where high concentrations of TCE have been measured. Furthermore this is in an area of relatively thick Arapahoe Sandstone #1 and, according to the model described in Figure 2 9 this location is in a low area in the upper HSU Vertical gradients are evaluated by means of water levels in wells screened at different depths within the nest Well 36-87 can also be used in evaluating vertical gradients The primary purpose of this cluster is to evaluate the potential for vertical migration in an area of known contamination
C 33 Cluster #2	The Division recommends moving this location 200' to the southeast We are concerned that the present location is too far from control in sands #3 and #4 to assure success An added advantage of the new location would be that it is between wells 18-87 and B217689 both of which are current sand #4 monitoring wells We also recommend a twin to well 18-78 to be screened in sand #3	The recommended offset has been considered, however based on its proximity to wells 20-87BR and 18-87BR, and since it appears it will penetrate both the #3 and #4 sandstone its location will remain unchanged

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C 34 Cluster #7	The Division recommends moving this location 150 to the north northeast At this new location, penetrating sand #4 would be more likely and the odds of picking up sand #3 would be improved The Division also suggests drilling borehole B7 through the sand #5 stratigraphic level. In addition, we recommend drilling two twins to well B217789 to be screened in sands #3 and #4	The recommended offset will be made and the borehole will be drilled to the stratigraphic equivalent of the Arapahoe Sandstone #5 Consistent with the disposition of Citation C 31 additional wells will not be drilled unless unexpected sandstones are encountered
C 35 Cluster #9	The Division recommends moving this location 175 to the southwest This would be closer to well 31 87 which is a sand #3 monitor and the new location would improve the chances of picking up sand #3 Also this location is closer to the trenches and may help evaluate releases from them The Division also suggests that borehole B9 be drilled through the stratigraphic level of sand #5	The recommended offset will be made and the borehole will be drilled to the stratigraphic equivalent of the Arapahoe Sandstone #5
C 36 Cluster #12	The Division suggests drilling borehole B12 through the stratigraphic level os sand #5 Also, we feel that the location for Cluster 12 may penetrate sand #4 and, if it does, a well should be added to monitor this sand. In addition, we suggest drilling twins to wells 62-86 and 6-87A for the purpose of monitoring sand #4	See disposition of Citation C 31
C 37 Cluster #13	The Division suggests drilling borehole B13 through the stratigraphic level of sand #5 We also suggest that W32 be removed from this plan until B13 proves the existence of a deeper sand. There is no evidence presented in this plan that sand #2 will be penetrated at this location.	See disposition of Citation C 31

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C 38 Cluster #14	The Division suggests drilling borehole B14 through the stratigraphic level of sand #5 We also suggest that a twin be drilled to well 14-87 to monitor sand #4 at that location	See disposition of Citation C 31
C 39 Cluster #18	The Division suggests drilling borehole B18 through the stratigraphic level of sand #5	All boreholes will be drilled to the stratigraphic equivalent of the Arapahoe Sandstone #5
C-40 Cluster #19	The Division suggests adding a twin to well B217419 to monitor sand #4 at that location In addition, we feel that there is a good chance of picking up sand #4 at the cluster 19 location and a monitor well for this sand may be necessary	See disposition of Citation C 31
C 41 Cluster #20	The Division suggests adding a twin to well 16-87 to monitor sand #3 If borehole B20 penetrates sands #3 and #4 please plan on installing monitor wells at this location.	See disposition of Citation C 31
C-42 Table 8-1 General.	In addition to the 20 clusters proposed in this plan, the Division feels several more clusters should be added. Initially these could be added as boreholes only pending the encountered stratigraphy If sands are penetrated, then follow up stages of this RFI/RI could install monitoring wells screened in these sands We suggest that all of these boreholes be drilled to at least the stratigraphic level of sand #5 The locations for the boreholes we would like added to the program are as follows. B21 250' south of well 28-87 B22. 200' southeast of B218189 B23 600' north northeast of well 40-86 B24 140' northwest of well 36-87	See disposition of Citation C 31

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	These locations are all downgradient from the east end of the east trenches and from the east spray fields and are in areas potentially contaminated, but currently not in the plans to be characterized In summary we have suggested moving four of the 20 cluster locations, adding an additional four boreholes for stratigraphic testing, deepening six of the 20 planned boreholes, and drilling eight twins to existing wells Hopefully these changes can be worked in to the plan without adversely affecting the budget for this project	